

FLORISTIC COMPOSITION AND PHYTOSANITARY STATE OF THE ARBORAL COVERAGE OF THE URBAN PARK FO THE CITY OF RECIFE-PE

ABSTRACT

The process of disordered urbanization was reduced drastically as the natural areas, which formerly was necessary, the current times of occurrence of empty spaces, which was not different in the City of Recife, but not the District of Dois Irmãos. With the purpose of protecting a fragment of the Atlantic Forest and reducing the pressure on the environment, a state conservation unit was created called Dois Irmãos State Park (PEDI). In this perspective, the study had an objective of surveying the species of shrubs and the analysis of the phytosanitary present in the arborization of the zoological sector of the State Park of Dois Irmãos. With the objective of subsidizing the promotion and development of activities related to environmental education. The survey of plants was made from new census models. In this inventory 369 arboreal individuals were present at the PEDI Zoo, belonging to 25 botanical families, 48 genera and 60 species. Among these are the species, two were of gender level and one was classified as indeterminate. Of the species studied, 70% are natural, 25% exotic and 5% remain unclassified. Regarding plant health, 81.57% of the population is in good condition, 3.52% regular and 14.9% bad. From the DAP and the DAP, it is possible to infer that the data is compiled by processes in the adult phase. It is hoped that this is a game of the child by the Park, in order to promote and disseminate the knowledge of the species inserted in it, thus seeking to raise awareness of the benefits generated by them.

Keywords: Tree species, Atlantic Rainforest, Environmental education, Plant health.

1. INTRODUCTION

Urbanization and current population growth have resulted in significant losses of animal and plant species, as well as changes in species composition to more cosmopolitan and less complex sets (MCKINNEY, 2006). According to Troian et al. (2011), the transformation of the natural landscape into urban landscapes goes through profound modifications of the biotic and abiotic elements of the associated ecosystems, such as soil, climate, air, water, flora and fauna.

Due to the great urban advance and forest fragmentation in Brazil, remnants of ecosystems with greater or lesser human impact become increasingly frequent. According to Ribeiro et al. (2009), there remains 11.73% of Atlantic Forest in Brazil, with 32-40% corresponding to secondary forests in intermediate stages of succession, and about 80% of these fragments have less than 50 hectares. In the state of Pernambuco, the Atlantic Forest domain area,

which corresponded to approximately 380 thousand hectares, remains only 12.1% (OLIVEIRA, 2011).

It should be noted that one of the main ways to reduce the effects of fragmentation and the continuous reduction of existing remnants is to create and / or maintain urban green areas, which serve as ecological trampolines, increasing connectivity between forest fragments, (Júnior et al., 2003; RIBEIRO et al., 2009). Thus, the encouragement of the creation of federal, state and municipal conservation units, which include the remaining urban fragments of the may be an alternative to expand the connectivity between fragments and, thus, the conservation of ecosystems on a landscape scale (TROIAN et al., 2011).

In an attempt to preserve the fragments of the Atlantic Forest in Pernambuco, in 1987, 40 reserves were created in the Metropolitan Region of Recife, under Law No. 9,989 (PERNAMBUCO, 1987), deserving special attention to the Reserva Ecológica da Mata de Dois Irmãos, for being one of the largest urban fragments (FIDEM, 1987). According to Pessoa (2009), only in 1997, Jardim Zoobotânico do Recife, which encompassed the Ecological Reserve, Zoological and Açude do Prata, was renamed Dois Irmãos State Park. It is known that urban forest fragments, surrounded by a housing matrix, mostly contain testimonies of the tree flora of the region and show the importance of its conservation, thus increasing the educational potential of urbanized fragments (CIELO FILHO; SANTIN, 2002).

For the knowledge of the real situation of this conservation unit, the study of floristics, together with the qualitative evaluation and the dendrological characterization of the arboreal vegetation can provide subsidies to the planning, management, education and management of this unit, considering that they influence directly or indirectly in the safety, knowledge and improvement of the quality of life of the population that uses it, for moments of leisure and / or contact with nature.

Studies have shown that floristic surveys are an important tool for the knowledge of biodiversity, since they provide valuable information about the current situation of Brazilian forests (SCHAAF et al., 2006). Therefore, species inventories form the basis of any study that is committed to the correct assessment of the value of an ecosystem, its conservation and management (FUHRO et al., 2005). In the light of these facts, the present study was developed with the aim of surveying the tree species and analyzing the phytosanity of the individuals present in the afforestation of the zoological sector of Dois Irmãos State Park, in order to promote the promotion and development of activities focused on environmental education.

2. MATERIAL AND METHODS

2.1 Study area

This study was carried out in the area of visitation of the Zoological sector, with approximately 14 ha (Figure 1), inserted in the State Park Dois Irmãos (PEDI), in the city of Recife, Pernambuco, from November 2013 to January 2014. PEDI has, remnant of Mata Atlântica called Mata de Dois Irmãos, according to Veloso et al. (2012), is classified as Dense Ombrophilous Forest. Soils are classified as dystrophic Red-Yellow Latosol, varying in texture from sandy to sandy-clay, with pH from 4 to 5 (JACOMINE, 2009).

According to Koppen 's classification, the climate is As - rainy, hot and humid tropical, with average monthly temperatures above 23°C, presenting a period of high humidity between

the months of March and August, with maximum rainfall occurring in June and July (COUTINHO et al., 1998).

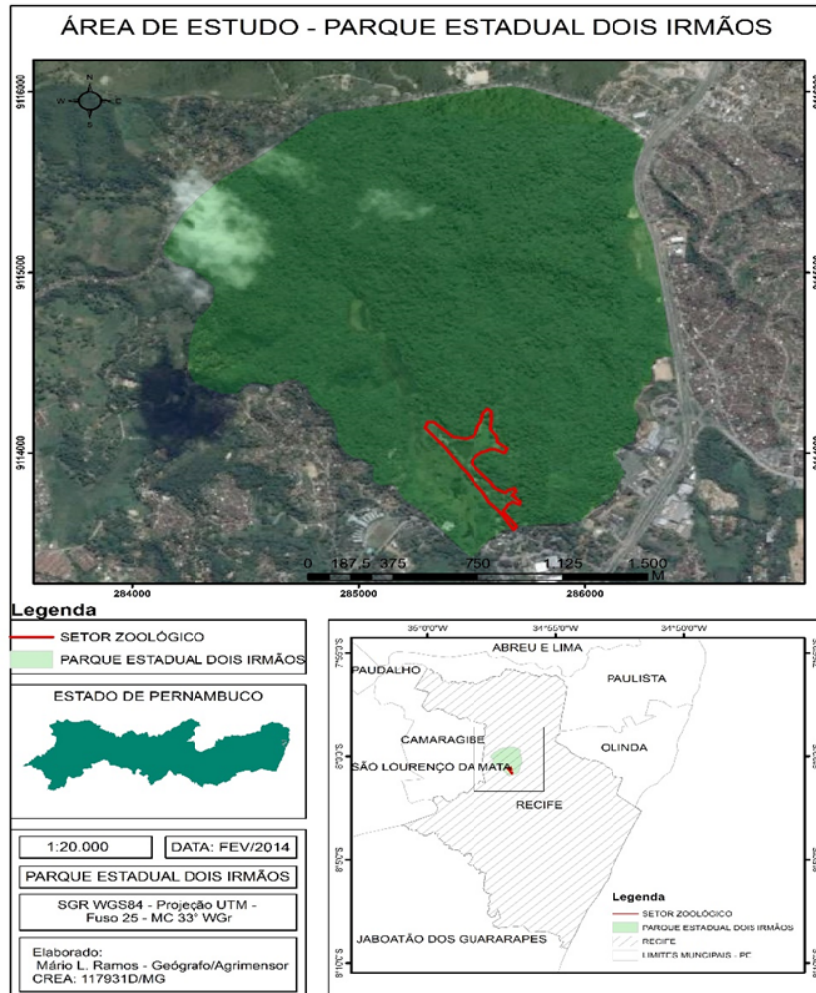


Figure 1. Location of the study area, Zoological Sector, Dois Irmãos State Park, Recife-PE.

2.2 Floristic survey

The floristic survey was carried out using the census-type inventory, which sought to qualitatively and quantitatively analyze all living arboreal individuals with the Chest Height (CAP) ≥ 15 cm.

For the identification of tree individuals, fertile or sterile botanical material was collected using high pruning shears, with 2m modules. Dendrological characters, especially regarding trunk appearance, live bark and the presence of exudates were observed, to assist in the process of identification of sterile materials. The material was pressed and dried according to conventional techniques (MORI et al., 1989). The identification was carried out in the

Herbarium Sérgio Tavares (HST) of the Department of Forestry Science, Federal Rural University of Pernambuco, through specialized bibliography or by comparisons with existing exsiccates and correctly identified by specialists.

The species separation by family was performed according to the Angiosperm Phylogeny Group III system (APG III, 2009), and the list of species authors according to Brummitt and Powell (1992). To classify the species, according to the origin, was denominated native species that originated in the Brazilian territory.

2.3 Diameter, height and plant health of trees

The characteristics and the selected parameters were considered of fundamental importance for the knowledge of the quality of the arborization present in the PEDI. These characteristics and parameters are described below, as described by Silva (2000):

Diameter at breast height (DAP): refers to trunk diameter in centimeters, measured at 1.30 m above ground. The values were obtained with the help of a scale, providing the actual values of CAP (Circumference at Chest Height) that were later converted to diameter values.

Total height: Refers to the total height of the tree in meters, being considered from the soil surface, to the leaves at the apex of the highest branch. The values were obtained by means of an estimation, using high shear pruning shears, with modules of 2 m in length.

Phytosanity: it was evaluated visually by the physical aspect of the tree. The criteria adopted were: good, when the individual presented vigorous, without signs of pests, mechanical damages or diseases; regular, when it presented average conditions of vigor for a certain place, being able to present small problems of plagues, diseases or physical damages and; bad, when the tree presented a general state of decline or with a strong attack of pests; and diseases and serious physical damage.

To obtain the results, the Excel program (2010) was used, using the counting pattern and percentage application of the qualitative data acquired in the research.

3. RESULTS AND DISCUSSION

3.1 Floristic

In the zoo sector of Dois Irmãos State Park, 369 arboreal individuals belonging to 25 botanical families, 48 genera and 60 species were inventoried. Among these species, three were identified only at the genus level and one species was not identified, being denominated Indeterminate (Table 1). Regarding the origin, 75% were classified as native, 21.67% as exotic and 3.33% remained unclassified. The species denominated without characterization were those denominated as indeterminate and those identified only at the genus level.

Table 1. Species registered in the floristic survey of the Zoological sector, arranged in alphabetical order of family present in Dois Irmãos State Park, Recife, Pernambuco.

Families / Species	NV	NI	F(%)	Source
ANACARDIACEAE				
<i>Anacardium occidentale L.</i>	Cajueiro	2	0,54	Native

<i>Mangifera indica</i> L.	Mangueira	22	5,96	Exotic
<i>Spondias mombin</i> L.	Cajazeiro	6	1,63	Native
<i>Schinus terebinthifolius</i> Raddi	Aroeira	3	0,81	Native
<i>Tapirira guianensis</i> Aubl	Cupiúba	4	1,08	Native
ANNONACEAE				
<i>Annona montana</i> Macfad.	Aticum	3	0,81	Native
<i>Xylopia frutescens</i> Aubl	Imbiuba	1	0,27	Native
ARALIACEAE				
<i>Schefflera morototoni</i> (Aubl.) Maguire, Steyer. & Frodin	Sambacuim	6	1,63	Native
BIGNONIACEAE				
<i>Handroanthus heptaphyllus</i> (Vell.) Mattos	Ipê-roxo	1	0,27	Native
<i>Handroanthus cf. impetiginosus</i> (Mart. ex DC.) Mattos	Ipê-roxo	12	3,25	Native
<i>Handroanthus serratifolius</i> (A.H.Gentry) S.Grose	Ipe Amarelo	1	0,27	Native
<i>Handroanthus</i> sp	Ipê	1	0,27	Sc
<i>Tabebuia aurea</i> (Silva Manso) Benth. & Hook.f. ex S.Moore	Craibeira	2	0,54	Native
BURSERACEAE				
<i>Protium heptaphyllum</i> (Aubl.). Marchand	Amescla de cheiro	15	4,07	Native
CANNABACEAE				
<i>Trema micranta</i> L.	Imbiúba	1	0,27	Native
CHRYSOBALANACEAE				
<i>Couepia rufa</i> Ducke	Oiti coró	1	0,27	Native
<i>Licania tomentosa</i> (Benth.) Fritsch	Oitizeiro	20	5,42	Native
COMBRETACEAE				
<i>Buchenavia tetraphylla</i> (Aubl.) R.A.Howard	Bugenavea	4	1,08	Native
<i>Terminalia catappa</i> L	Castanhola	7	1,90	Exotic
ELAEOCARPACEAE				
<i>Sloanea guianensis</i> (Aubl.) Benth.	Mamajuba	1	0,27	Native
EUPHORBIACEAE				
<i>Hevea brasiliensis</i> (Willd. ex A.Juss.) Müll.Arg.	Seringueira	2	0,54	Native
FABACEAE				
<i>Adenanthera pavonina</i> L.	Olho-de-pombo	3	0,81	Exotic
<i>Albizia lebbek</i> (L.) Benth	Albizia	2	0,54	Exotic
<i>Albizia pedicellaris</i> (DC.) L.Rico	Jaguarana	1	0,27	Native
<i>Anadenanthera colubrina</i> var. <i>cebil</i> (Griseb.) Altschul	Angico	4	1,08	Native
<i>Andira cf. nitida</i> Mart. Ex Benth	Angelim	6	1,63	Native
<i>Bowdichia virgilioides</i> Kunth	Sucupira	13	3,52	Native
<i>Caesalpinia echinata</i> Lam.	Pau-brasil	18	4,88	Native
<i>Clitoria fairchildiana</i> R.A. Howard	Sombreiro	69	18,7	Native
<i>Delonix regia</i> (Bojer e Hook)Raf	Flamboyant	3	0,81	Exotic
<i>Enterolobium contortisiliquum</i> (Vell.) Morong	Timbaúba	1	0,27	Native
<i>Erythrina variegata</i> L.	Brasileirinho	2	0,54	Exotic
<i>Inga laurina</i> (Sw.) Willd.	Ingá branco	4	1,08	Native
<i>Inga thibaudiana</i> DC.	Ingá branco	4	1,08	Native
<i>Inga vera</i> (Vell.) Mart.	Ingá	15	4,07	Native
<i>Pithecellobium dulce</i> (Roxb.) Benth.	Mata fome	3	0,81	Exotic

<i>Senna siamea</i> (Lam.) H.S. Irwin E Barneby	Cassia Amarela	1	0,27	Exotic
LECYTHIDACEAE				
<i>Eschweilera ovata</i> (Cambess.) Mart. ex Miers	Embiriba	19	5,15	Native
MALPIGHIACEAE				
<i>Byrsonima sericea</i> DC.	Murici	1	0,27	Native
MALVACEAE				
<i>Ceiba pentandra</i> (L.) Gaertn	Sumaúma	4	1,08	Native
<i>Pachira aquatica</i> Aubl.	Carolina	1	0,27	Native
MELIACEAE				
<i>Guarea guidonia</i> (L.) Sleumer	Gitó	10	2,71	Native
MORACEAE				
<i>Artocarpus heterophyllus</i> Lam.	Jaqueira	3	0,81	Exotic
<i>Ficus benjamina</i> L.	Figueira	20	5,42	Exotic
<i>Ficus gomelleira</i> Kunth	Ficus	4	1,08	Native
<i>Ficus</i> sp.	-	3	0,81	Sc
MYRTACEAE				
<i>Eugenia luschnathiana</i> (O.Berg) Klotzsch ex B.D.Jacks.	-	2	0,54	Native
<i>Eugenia pyriformis</i> Cambess	Ubaia	1	0,27	Native
<i>Syzygium cumini</i> (L.) Skeels	Azeitona roxa	3	0,81	Exotic
OXALIDACEAE				
<i>Averrhoa carambola</i> L.	Carambola	1	0,27	Exotic
PERACEAE				
<i>Pera glabrata</i> (Schott) Poepp. ex Baill.	Pera ferrugínea	4	1,08	Native
PINACEAE				
<i>Pinus elliotii</i> Engel	Pinus	1	0,27	Exotic
SALICACEAE				
<i>Casearia</i> sp.	Casearia	3	0,81	Native
SAPINDACEAE				
<i>Talisia esculenta</i> Radlk.	Pitombeira	3	0,81	Native
SAPOTACEAE				
<i>Pouteria grandiflora</i> (DC.) Baehni	Oiti-toroba	1	0,27	Native
STERCULIACEAE				
<i>Sterculia chicha</i> A.St-hil ex Turpin	Chichá	1	0,27	Native
URTICACEAE				
<i>Cecropia pachystachya</i> Trécul	Embaúba	18	4,88	Native
UNDETERMINED				
Undertermined	-	2	0,54	Sc
Total		369	100	

* NV: common name, NI: number of individuals, F (%): frequency in percentage and origin: Native, Exotic or unclassified - NC.

The species *Clitoria fairchildiana* was predominant in the PEDI area, with 69 individuals representing 18.70% of the total of individuals, followed by *Mangifera indica* L., with 5.96%; *Ficus benjamina*, with 5.42%; *Licania tomentosa* Fritsch, with 5.42%; *Eschweilera ovata* (Cambess, with 5.15%, *Caesalpinia echinata*, with 4.88%; *Cecropia pachystachya* with 4.88%; *Inga vera* 4.07%; *Protium heptaphyllum* (Aubl.) Marchand, 4.07%, and *Bowdichia virgilioides* Kunth, 3.52%, with the ten species most frequently representing 62.07% of the population (Table 2). Similar condition was found in the municipality of Guaçuí-ES, where the ten most frequent species represented 62.5% of the population (GRUGIKI et al., 2009) and in the municipality of Socorro, SP, where 67.8% of the sample SARTORI; BAALDERI., 2011).

The species *Clitoria fairchildiana* (Sombreiro), considering the whole sample, was the only non-standard proposed by Milano and Dalcin (2000), who recommend a frequency of 10 to 15% in urban areas of the same species, seeking to avoid having serious problems arising from pest and disease attacks.

Table 2 List of the 10 most frequent tree species.

Common name	Scientific name	NI	Freq.(%)
Sombreiro	<i>Clitoria fairchildiana</i> R.A. Howard	69	18,70
Mangueira	<i>Mangifera indica</i> L.	22	5,96
Ficus	<i>Ficus benjamina</i> L.	20	5,42
Oiti	<i>Licania tomentosa</i> (Benth.) Fritsch	20	5,42
Embiriba	<i>Eschweilera ovata</i> (Cambess.) Mart. ex Miers	19	5,15
Pau-brasil	<i>Caesalpinia echinata</i> Lam	18	4,88
Embaúba	<i>Cecropia pachystachya</i> Trécul	18	4,88
Ingá	<i>Inga cf. sessilis</i> (Vell.) Mart.	15	4,07
Amescla	<i>Protium heptaphyllum</i> (Aubl.) Marchand	15	4,07
Sucupira	<i>Bowdichia virgilioides</i> Kunth	13	3,52
Total		229	62,07

*NI: Number of Individuals and Freq. (%): Frequency in Percentage.

The most representative family was Fabaceae with 16 species (Figure 2). According to Lima (2000), this family is considered the largest family in Brazil, and according to the List of Species of Flora of Brazil (2014), the family has 2,732 species and 212 genera, being distributed in all Brazilian biomes.

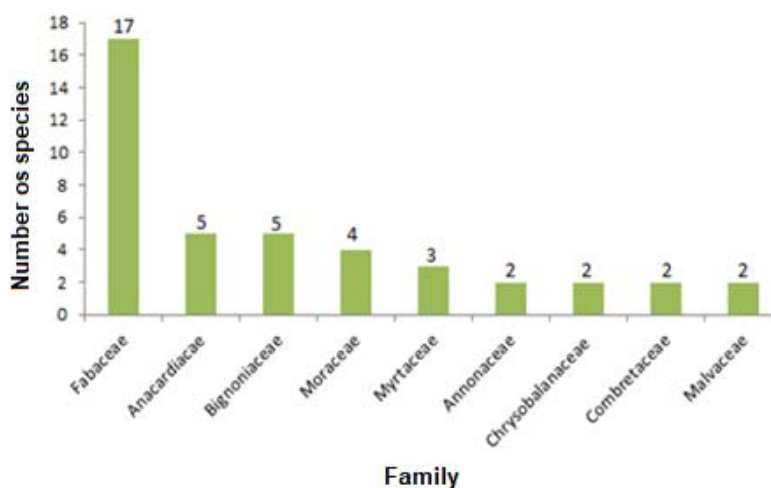


Figure 2. The ten most frequent families in the area of visitation in the Zoo sector.

3.2 Height, Diameter and Plant Health

Analyzing the total height, we can see the predominance of trees in the last five classes, with tree individuals varying from 11.49 to 22.10 m, representing 63.73% of the individuals sampled (Figure 3).



Figure 3. Frequency of height classes observed in the area of visitation in the Zoological sector.

Regarding Chest Diameter to Height (DAP), the highest concentration of individuals occurred in the 2nd class (18.48 cm - 32.38 cm), being therefore a population with a small number of young trees (Figure 4).

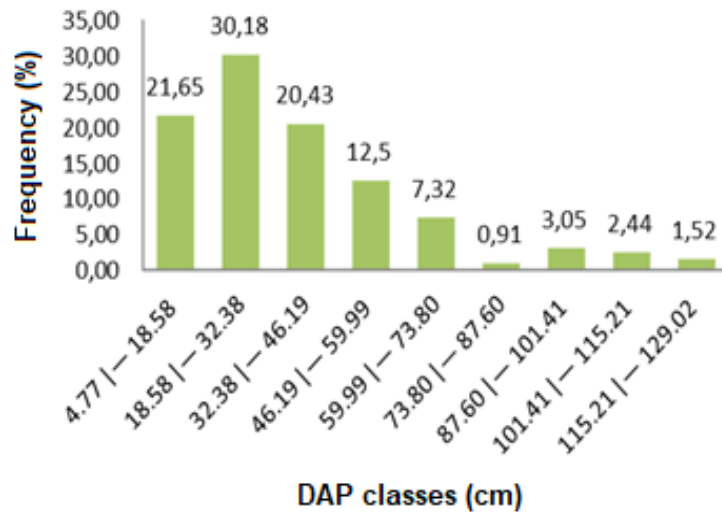


Figure 4. Frequency of DAP classes observed in the area of visitation in the Zoological sector.

Considering the values obtained with DAP and total height, it was possible to infer that most trees are composed of individuals in the adult phase. This result is of fundamental importance regarding the management of this vegetation, because as the conservation unit

receives visitors throughout the year, it is necessary to monitor and appropriately manage these individuals in order to avoid accidents, such as, for example, fall of trees.

With respect to plant health, 81.57% of the population had good phytosanitary conditions, because they were visually without signs of pests and diseases; 3.52%, in regular conditions, where the individuals presented medium vigor conditions, being seen small problems of pests, diseases; 14.9%, in bad conditions, being observed in the individuals in this general state of decline, where these individuals presented a strong attack of pests, diseases or physical damages (Figure 5).

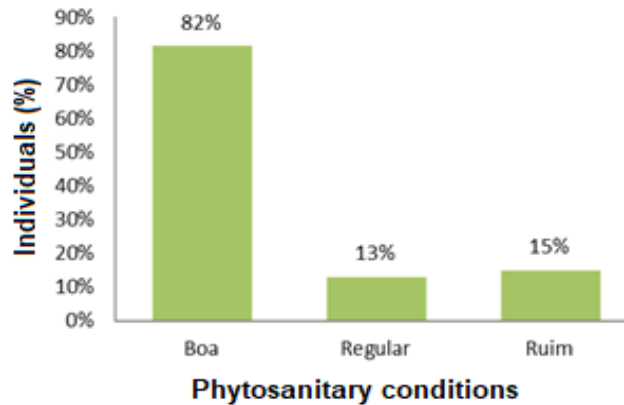


Figure 5. Phytosanitary conditions of the species present in the zoological sector.

Individuals in bad conditions were often the consequence of poor management, as exemplified in Photo 1. This is an individual of the species *Buchenavia tetraphylla*, with a rotting stem resulting from physical damage, or by species attacked by the pest "*Psilidus sombreiro*" (*Euphalerus clitoria* e Burckhardt & Guajará) (Photo 1B). At this time of the year, it is very common the attack of this pest on shade individuals in several places in the city of Recife and Metropolitan Region (GODIN JÚNIOR et al., 2005; MARQUES et al., 2002).



Photo 1. Individual of *Buchenavia tetrphylla* presented with decaying stem (A), individual of *Clitoria fairchildiana* seriously attacked by the pest *Euphalerus clitoria* e Burckhardt & Guajará (B).

The high number of individuals in good phytosanitary conditions may be associated with the existence of a diversity of species present in the area and the proximity to the mata de dois irmãos, reducing the attack of pests and diseases. Silva and Silva (2012), affirm that individuals with good phytosanitary conditions normally perform their ecological functions, contributing in terms of microclimatic amenability, reduction of air pollution, sound and visual, as well as psychological benefits.

Also in the afforestation of the park, some arboreal individuals with traces of depredation, of the type writings in the trunk of the trees, were verified. Predation actions are very common in several parks and Lacerda et al. (2010) argue that park management should promote educational campaigns to educate the visiting population about the benefits of adequate tree planting and thus create a conscious society that will actively participate in its maintenance.

4. CONCLUSION

This study showed that floristic surveys are an important tool for understanding biodiversity. He provided valuable information on the conservation and management of Dois Irmãos State Park (PEDI) in the city of Recife. In fact, many species in good health were registered in this State Park in order to lead the promotion and development of activities focused on environmental education, which is the key to the solution of climate change

REFERENCES

- [1] APG III. An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG III. Botanical Journal of the Linnean Society, v. 161, p.105-121, 2009
- [2] Brummitt PK, Powell, C. Emma. Authors of plant names. ROYAL BOTANIC GARDENS KEW, 1992.
- [3] Cielo Filho R. Santin DA. Floristic and phytosociological study of an urban forest fragment-Bosque dos Alemães, Campinas, SP. Brazilian Journal of Botany, v. 25, n. 3, p. 291-301, 2002.
- [4] Coutinho RQ et al. Climatic, geological, geomorphological and geotechnical characteristics of Dois Irmãos Ecological Reserve. In: MACHADO, IC.; LOPES, AV.; PORTO, K C. Dois Irmãos Ecological Reserve: studies on a remnant of Atlantic Forest in an urban area, Recife-PE, Brazil. Recife: Ed. da UFPE, 1998.
- [5] Junior CL et al. Ecological trampolines and multiple benefit zones: agroforestry tools for the conservation of fragmented rural landscapes in the Brazilian Atlantic Forest. Nature and Conservation Magazine, v. 1, n. 1, p. 37-46. 2013.
- [6] Fidem. Ecological reserves of the Metropolitan Region of Recife. Urban Development and Environment Series, Recife, Brazil, 1987, p. 108.

- [7] Fuhro D, Vargas D, Larocca J. Floristic survey of the herbaceous, shrub and liana species of the slope forest of Ponta do Cego, Lami Biological Reserve (RBL), Porto Alegre, Rio Grande do Sul, Brazil. *Research, Botany, São Leopoldo*, N ° 56, São Leopoldo: Instituto Anchietano de Pesquisas, 2005, 239-256 p.
- [8] Gondim Junior MGC, Barros R, Silva FR, Vasconcelos GJN. Occurrence and biological aspects of the clitoria tree psyllid in Brazil. *Scientia Agricola, Piracicaba*, v. 62, n. 3, p. 281-285, 2005.
- [9] Grugiki MA, Vervloet Filho RH, Silva AG. Diagnosis of urban afforestation in the municipality of Guaçuí. In: XIII BRAZILIAN URBAN ARBORIZATION CONGRESS, 2009, Rio Branco. XIII BRAZILIAN CONGRESS OF URBAN TREATMENT. Rio Branco: SBAU, v. 1. p. 1-12, 2009
- [10] Jacomine PKT. The new Brazilian classification of soils, Recife, *Annals of the Pernambuco Academy of Agronomic Science, Recife*, vols. 5 and 6, p.161-179, 2009.
- [11] Lacerda NP et al. Perception of the residents on the afforestation of the city of São José de Piranhas - PB. *Revista Brasileira de Arborização Urbana, Piracicaba - SP*, v.5, n. 4, p.81-95, 2010
- [12] Lima HC. Leguminous trees of the Atlantic Forest: an analysis of the richness, patterns of geographic distribution and floristic similarities in forest remnants of the State of Rio de Janeiro. 2000. 133 f. Thesis (PhD in Forest Sciences) Federal University of Rio de Janeiro, Rio de Janeiro.
- [13] Lohmann LG. Bignoniaceae in List of Species of Flora of Brazil. Botanical Garden of Rio de Janeiro. Available in: <<http://floradobrasil.jbrj.gov.br/jabot/floradobrasil/FB114086>>. Accessed on: 18 Feb. 2014
- [14] Marques EJ, France IWB, Menezes M. Occurrence of *Cladosporium cladosporioides* (Fres.) De Vries in *Euphalerus clitoriae* Burckhardt & Guajará, 2000
- [15] McKinney ML. Urbanization as a major cause of biotic homogenization. *Biological Conservation* 127, p.247-260, 2006.
- [16] Milano M, Dalcin E. Afforestation of public roads. Rio de Janeiro: LIGHT, 2000. 226p.
- [17] Morl AL, Silva LAM, Lisboa G, Coradin L. Handbook of phanerogamic herbarium. Cocoa Research Center. Ilheus. 2 ed. 104p. 1989.
- [18] Oliveira LSB. Study of the arboreal component and edge effect in fragments of Atlantic Forest in the catchment area of the Tapacurá River - PE. 2011. 92f. Dissertation (MSc in Forest Sciences) - Federal Rural University of Pernambuco, Recife.
- [19] Ribeiro MC, Metzger JP, Martensen AC, Ponzoni FJ, Hirota MM. Brazilian Atlantic forest: how much is left and how is the remaining forest distributed? Implications for conservation. *Biological Conservation*, v. 142, p.1141-1153, 2009.
- [20] Sartori AR, Balderi AP. Inventory of the urban afforestation of the municipality of Socorro - SP and proposal of an index of damages to the infrastructure of the cities. *Revista Brasileira de Arborização Urbana, Piracicaba - SP*, p.68-89, 2011.

[21] Schaaf LB, Figueiredo Filho A, Galvão F, Sanquetta CR, Longhi SJ. Floristic-structural modifications of a remnant of Mixed Ombrophilous Forest Montana in the period between 1979 and 2000. *Forest Science*, Santa Maria, v.16, n.3, p. 271-291, 2006.

22. Silva AG. Evaluation of afforestation in the urban perimeter of Cajuri-MG, by the Synthetic Framework Method. Viçosa, MG: UFV, 2000. 150 f. Dissertation (Master in Forest Science) - Federal University of Viçosa, Viçosa, MG, 2000.

[23] Silva AG, Silva AG. Qualitative and quantitative inventory of tree and shrub species in squares of the Floresta neighborhood in the city of Belo Horizonte - MG. *Encyclopedia Biosphere*, Goiânia, 2012.

[24] Troian LC et al. Floristics and structural patterns of an urban forest fragment, metropolitan region of Porto Alegre, RS, Brazil. *Iheringia. Botany Series*, v. 66, n. 1, p. 5-16, 2011.

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